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JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 39. December, 1937. No. 468.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

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RHODORA.—**A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.**

Address manuscripts and proofs to
M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

Entered at Lancaster, Pa., Post Office as Second Class Mail Matter.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 39. December, 1937. No. 468.

LOCAL PLANTS OF THE INNER COASTAL PLAIN OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(*Continued from page 459*)

Part III. Phytogeographic Considerations

The flora of the Coastal Plain of Virginia is far more complex than has been generally recognized. Without attempting at this time a general discussion of all the floristic elements, it seems desirable to take up certain features which do not require prolonged consideration.

1. The Pine-Barren Flora. The idea has been much propagated, that Virginia has few of the characteristic species which give special interest to the Pine Barrens of New Jersey and the region centering on Wilmington in southeastern North Carolina. This idea has been specially developed by the southern botanist, Dr. R. M. Harper, who, having known some of the more concentrated pine barrens farther south, has seen, from the moving express train, little to interest him in eastern and southeastern Virginia. His verdicts follow: "The coastal plain of Delaware, Maryland and Virginia seems to lack many of the species common in New Jersey and the southern pine-barrens, though some of them will probably be reported when those parts are better explored."[1] "Of the country between Norfolk and Emporia there is little to be said . . . More swamps and bogs were seen west of Norfolk . . . but no true pine-barrens"[2]; "For some reason not altogether obvious, the flora of those parts of

[1] R. M. Harper, as reported in Torreya, vii. 44 (1907).
[2] R. M. Harper, Torreya, ix. 220, 221 (1909).

the eastern United States where either *Pinus Taeda* or *Pinus echinata* is the most abundant tree is rather uninteresting, as it consists of comparatively few and widely distributed species; and such regions are consequently not much frequented by botanists and not often described in botanical literature"[1]; "The pine-barrens of New Jersey and those of the southeastern states have been celebrated botanizing grounds for a century or more; but in the corresponding regions between the Delaware and Roanoke Rivers [the lower Roanoke River in North Carolina] there seem to be very few typical pine-barren plants, or other species, which are not more common elsewhere. It is not surprising therefore that comparatively little has been published about this region."[2]

Handicapped, then, by the abundance of either *Pinus Taeda* or *P. echinata*, the Coastal Plain of southeastern Virginia should not, by Harper's interpretation, be worth visiting by a botanist. Nevertheless, in search for a productive area for range-extensions and novelties, I have been there at intervals in four successive summers, Long has had three seasons and Griscom parts of two; we have just been busy with still another year of thrilling discoveries and range-extensions. Areas of true pine barren, resembling those of New Jersey or southeastern North Carolina are, indeed, limited in extent and very few in eastern Virginia, and they are not seen nor explored from express trains. The best and most typical pine barren we yet know lies between the two railroads from which Harper made his chief observations in riding between Portsmouth and Petersburg and, again, between Portsmouth (or Norfolk) and Emporia. There we get, scattered in the half-shade of *Pinus Taeda* or *P. echinata*, such pine-barren plants, mostly already noted (and here mentioning only a few) as *Panicum lancearium*, *Rynchospora distans*, *Scleria ciliata* Michx., var. *Elliottii* (Chapm.) Fern., *Xyris flexuosa* (*arenicola*), *Juncus abortivus* (MAP 28), *Zigadenus glaberrimus*, *Quercus laevis* (*Catesbaei*), *Polygonella polygama*, *Arenaria caroliniana* (MAP 29), *Crotalaria rotundifolia* and *Purshii*, *Zornia bracteata*, *Desmodium tenuifolium*, *Euphorbia Ipecacuanhae*, *Rhexia ciliosa*, *Proserpinaca pectinata*, *Kalmia angustifolia*, *Pyxidanthera barbulata*, *Breweria humistrata*, *Trichostema lineare*, *Penstemon australis*, *Seymeria cassioides* (MAP 24), *Carphephorus tomentosus* and *bellidifolius* and *Helianthus angustifolius*.

[1] Harper, l. c. 217 (1909).
[2] Harper, l. c. 217, 218 (1909).

In the area south of the James and Chesapeake Bay and east of the main Seaboard Air Line, whence other car-window botanizing was done, many other worth-while pine-barren or pine-land species occur: *Andropogon Mohrii, Panicum strigosum, consanguineum* (MAP 47), *nitidum, longiligulatum, albomarginatum* and *mutabile* (MAP 15), *Agrostis elata* (MAP 30), *Ctenium aromaticum* (MAP 11), *Rynchospora fascicularis, Wrightiana* and *Torreyana* (MAP 32), *Carex Barrattii* (MAP 25), *Xyris ambigua* and *Curtissii, Lachnocaulon anceps, Eriocaulon decangulare, Tofieldia racemosa, Aletris aurea, Hypoxis sessilis* and *micrantha, Cleistes divaricata* (MAP 2), *Quercus cinerea, Asimina parviflora, Drosera brevifolia, Baptisia villosa, Rhynchosia tomentosa, Linum floridanum, Polygala Harperi* and (superabundant) *lutea* (MAP 45), *Cnidoscolus stimulosus, Ilex vomitoria, Hypericum setosum* and *denticulatum* var. *ovalifolium, Centella repanda, Lyonia lucida, Vaccinium Elliottii, Sabatia brachiata, Gentiana Porphyrio, Asclepias rubra, Schwalbea americana* (MAP 23), *Eupatorium leucolepis, Solidago pinetorum* and *fistulosa, Aster gracilis, Coreopsis gladiata,* etc., etc.

Such lists seem pretty good to one whose demands for a pine-barren flora are not too exacting. In fact, of the "*Characteristic Pine Barren Species*" of New Jersey enumerated by Stone in his *Plants of Southern New Jersey,* nearly all which could be expected so far south as Virginia are found in our area of the state. Stone enumerates 176 distinctive pine-barren species. Many of these are northern types (*Schizaea pusilla, Potamogeton confervoides, Eleocharis Robbinsii, Carex livida,* etc.), extending *down* to New Jersey from Newfoundland, Nova Scotia or New England. Excluding these and the few endemics of New Jersey and Delaware, we find that all but 16 of Stone's listed southern specialties of the New Jersey Pine Barrens, which do not extend north of New Jersey, actually occur in Virginia, in spite of the poor reputation given the latter area. 22 such species have been added by our parties to the known flora of Virginia and it is safe to predict that some of the others may be found. Conversely, checking the species in Small's *Manual* which are designated as growing in "pine-land" south of Virginia, it is gratifying to note that at least 115 such species[1] reach their northern known limits in eastern Virginia. Incidentally, we already have 30 endemic flowering plants in eastern Virginia, and some still unsettled collections may well add to the the number. These figures should help counteract the unfavorable estimates

[1] Many more have been added during 1937.

of the flora already quoted. New Jersey has been intensively and extensively botanized; so have the regions centering on Wilmington, North Carolina and Charleston, South Carolina; Virginia is still largely a botanically untouched field. In spite of the host of keen botanists from Pursh, Conrad, Nuttall, Collins, Pickering and others of their period and the Smiths (A. H. and C. E.), Canby, Parker and their contemporaries to Stone, Long and the others who have studied every square mile of southern Jersey, new discoveries are still being made in the Pine Barrens and elsewhere in southern New Jersey. Similarly, Walter, Elliott, M. A. Curtis, Ravenel and many others gave great impetus to study of the regions near Wilmington and near Charleston. But the Old Dominion has drifted along since the days of Clayton (two centuries ago) with no outstanding native student of the flora. With the awakening now going on real activity is hoped for.

Many of the southern Coastal Plain species which occur in southeastern Virginia have not been generally recognized as occurring north of southeastern North Carolina—the region centering upon Wilmington. Whether they are actually so isolated is a problem for the botanists of North Carolina. Others seem as yet to be unknown between South Carolina and southeastern Virginia, while others appear in Virginia to be still farther from their southeastern centers. These cases, which need not here be enumerated, suggest the need of extensive field-work also on the Coastal Plain between Virginia and Georgia.

Parenthetically, so to speak, it is impossible to overlook one aspect of the implication of utter poverty in interesting plants of the Coastal Plain of Virginia, already noted in the quotations in the opening paragraph of this section. The watching of vegetation from a moving train is and long has been a regular diversion of field-botanists but it is Harper who has so far developed the art as to draw considerable deductions from observations thus swiftly made and without verifying specimens.[1] A milder form of the sport is botanizing without

[1] The following titles of papers are suggestive:

Car-window Notes on the Vegetation of the Delaware Peninsula and southern Virginia. Torreya, ix. 217–226 (1909).

A quantitative Study of the more conspicuous Vegetation of the Coastal Plain, as observed in traveling from Georgia to New York in July. Bull. Torr. Bot. Cl. xxxvii. 405–428 (1910).

Notes on the Distribution of some Plants observed in traveling through the Coastal Plain from Georgia to New York in July, 1909. Bull. Torr. Bot. Cl. xxxvii. 591–603 (1911).

slowing down from a speeding automobile, "rumble-seat botany" as Dr. Lincoln Constance calls it. A slower period gave us the "horse-and-buggy" glimpser. Like the more up-to-date methods, even "horse-and-buggy" identifying was subject to possible error. For instance, in the paper of the late Lester F. Ward, already referred to, the author gave an account of a driving trip through Richmond and Petersburg to the Roanoke River in North Carolina. "My familiarity with the flora of Washington and vicinity rendered it both easy and interesting to note the more conspicuous changes . . . , and my notes were almost wholly confined to this aspect of the question. They were usually taken from the carriage, without stopping to make special researches"[1] and in the preceding paragraph it is stated that the notes were made "usually without collecting specimens." The notes are interesting and many of the identifications are unquestioned, but Ward's "Rubus cuneatus . . . [which] In the valley of the Nottoway river . . . has the habit of the northern blackberry and forms dense brambles . . . to the height of six or eight feet" would be clearer, in the light of present interpretations of *Rubus*, if he had made specimens! But horse-and-buggy and rumble-seat botanizing, without slowing down to collect specimens, as well as botanizing from the express train are all obsolescent. Witness the following: "These records, which are altogether right, must in fact be due to observations made from a sea-plane in 1924, as no old-time land-crab botanist has before 1931 visited these tracts."[2] As an "old-time land-crab botanist," I still find the old-time methods of exploring a flora the best. The "buggy," the railroad train and the automobile are invaluable aids, so long as they do not lead to inertia and superficiality, but land-crabbing is necessary if one wants to find the rarer and phytogeographically most interesting plants.[3]

A superficial Study of the Pine-barren Vegetation of Mississippi. Bull. Torr. Bot. Cl. xl. 551–567 (1914).

Five hundred Miles through the Appalachian Valley. Torreya, xiii. 241–245 (1913).

Car-window Notes on the Vegetation of the Upper Peninsula. Ann. Rep. Mich. Acad. Sci. xv. 193–198 (1913).

Southern Louisiana from the Car-window. Torreya, xx. 67–76 (1920).

A six-hour Cross-section of the Vegetation of southern Ontario. Torreya, xxvii. 1–8 (1927).

[1] L. F. Ward, *Notes on the Flora of Eastern Virginia*, Bot. Gaz. xi. 32 (1886).

[2] Scholander in Skrifter om Svalbard og Ishavet, Nr. 62: 28 (1934). I am indebted to Dr. Nicholas Polunin for directing my attention to Scholander's apt characterization.

[3] Returning to Massachusetts from southeastern Virginia, where I had been seeing the scarlet-orange *Asclepias lanceolata*, I caught a brilliant flash from the train as we crossed the boggy meadows near Kingston, Rhode Island. Positive of the identifica-

2. PHYTOGEOGRAPHIC RELATIONS OF THE CHARACTERISTIC PLANTS OF THE COASTAL PLAIN OF VIRGINIA. Reference has repeatedly been made to the very intimate commingling of the open pinelands and oak barrens with the richer woods, bottomlands and brooksides through much of the area. The obvious and presumably chief factor in the maintenance of this intimate interlocking of pine-barren and rich-woods or bottomland types of vegetation is the deposit of marine (calcareous) shells which underlies most, if not all, the country. Where the superficial soils are thoroughly leached the oxylophytes of the pine barrens and peats prevail. Where the brooks and rivers have cut down to the accessible lime, even though the soil, presumably on account of accumulated carbon-dioxide and humic acids, may give an acid reaction, the plants of "rich woods," "rich bottoms" and "calcareous soils" have their opportunity. The chemical, physical and biological balances are so extremely delicate and so complicated that it would be bold for one not a physical chemist to venture an evaluation of them; but it is fairly certain that only in regions where a supply of calcium is readily available in the subsoils would we find so obvious an interlocking of the calcicolous and the oxylophytic types. Even the almost ubiquitous Bald Cypress, *Taxodium distichum*, of the swamps, swampy bottoms and dismals, occurs, according to Wherry (in Small's Manual), "often over calcareous subsoil"; but Post Oak, *Quercus stellata*, he restricts to "usually sterile and acid soil," although *Hexalectris* (MAP 18), which at our station is in the humus of *Quercus stellata*, is, according to Wherry, a plant of "Rich soil." In this connection it is worth noting that Gattinger said of it (as *Bletia aphylla*) in Tennessee "Always under pines!"[1] At one of our two stations for *Carex Frankii* of "calcareous districts," there is an unusual abundance of the Cranefly Orchid, *Tipularia unifolia*, which, according to Wherry, occurs "in acid soil." In many wooded swamps and bottomlands *Carex typhina* of "rich alluvial woods, in calcareous districts" closely associates with its near relative, *C. squarrosa* of "Swampy woods, in acid soils" and with *C. louisianica* of "acid soils"; while along the Nottoway *C. Grayii* (MAP 19) of "Rich alluvial woods in calcareous districts" mingles with them all in the shade of trees of "calcareous" or of "acid" soil without sharp differ-

tion, I induced Mr. Weatherby to drive with me to the area and only reluctantly admitted that what I had seen from the speeding train was merely dwarf *Lilium superbum!*

[1] Gattinger, Tenn. Fl. 84 (1887).

entiation. Stepping from a carpet of *Crotalaria rotundifolia* of the dry, sandy woods to a depression a few feet below it, one may find himself in a damp thicket of *Gaylussacia dumosa* of "Acid swamps" or, near-by, descending ten feet from a similar *Crotalaria* carpet, he may be standing in *Malaxis floridana* of "calcareous soil."[1]

We, naturally, try to reduce plant-habitats to a limited number of categories but we should exercise caution and frankly admit our present ignorance of the crucial factors. The late George Harvey, trenchent and far-seeing critic of economic, political and social follies, wrote in one of his editorials on classificatory tendencies of sociologists: "There is no especial harm and there is much mental exercise to be obtained from reducing all mortality to these theoretical types—no especial harm, that is, supposing that one bears in mind what a constant whopper is involved in the reduction of any individual to a type."[2]

It surely seems, on the Coastal Plain of Virginia, that we are not yet able to separate with the specious satisfaction we get in some areas of more sharply contrasted soils the calcicolous from the calcifuge plants or otherwise to designate quite clear ecological types. There are many woodlands of *Quercus stellata* and *Carya alba* throughout southeastern Virginia but in only one have we yet found *Hexalectris spicata* (MAP 18), *Clematis ochroleuca* and *Houstonia tenuifolia*. Low boggy depressions are numerous, yet no botanist since Clayton had brought forward vouchers for *Cleistes divaricata* (MAP 2) in the state until we collected a few plants in one single such depression. Much of the sandy flat back of the outer beach from Cape Henry to False Cape shows a repetition of seemingly identical habitats, yet in that whole stretch we have found only one limited colony each of *Hypoxis Longii*, *H. sessilis*, *Juncus megacephalus*, *Eleocharis Lindheimeri* (MAP 57) and several other most definite species. Damp pine woods

[1] Similarly contradictory commingling of calcicolous and calcifuge (or oxylophytic) species may be seen in marl-bogs and marl-ponds farther north. Nadeau Lake in the township of Limestone, Aroostook County, Maine, is a deep bed of lime-marl, the only station known in the state for the strictly calcicolous *Potamogeton filiformis*, the marly border a carpet of *Eleocharis pauciflora* and other typical calcicoles. Nevertheless, commingled with them and evidently quite at home are the most characteristic oxylophytes of the region: *Drosera rotundifolia*, *Sarracenia purpurea*, *Chamaedaphne calyculata*, *Ledum groenlandicum*, *Andromeda glaucophylla*, etc. Exactly similar commingling of the two usually exclusive series may be witnessed in the marl-bogs of the Bruce Peninsula or on the lime-barrens of western Newfoundland. The lime is there for the plants which require it; its presence, so long as there is abundant CO_2, does not keep out the oxylophytes.

[2] Harvey's Weekly, ii. no. 47, pp. 12, 13 (Nov. 22, 1919).

are frequent, yet in such a habitat we have but once seen *Amianthium muscaetoxicum* and *Gentiana Porphyrio*, the latter so conspicuous that we could hardly have missed it. And so on, with one habitat after another; over and over again they seem superficially indistinguishable from others where quite unique colonies of plants are found. The fact, that one can never tell until he actually examines every natural spot what rare or strictly localized plant is there, adds to the zest of exploration and more than counterbalances the discomforts caused by heat, thirst, chiggers and deer-flies.

It is, of course, evident enough that clearing, cultivation, pig- and cow-pasturing and ditching have ruined much of what Banister, Clayton and others of two centuries ago found about them. The number of rarities undetected in Virginia since their day until the active exploration of the Coastal Plain by Grimes and those who have followed him is notable. Other species collected by Clayton, especially conspicuous trees and shrubs, not known through modern specimens from the state, make a challenging list. They may have been exterminated from the flora of the state; but success in discovering many species which Clayton collected but which have been little if at all known in the larger herbaria of the East gives confidence that the other Virginian plants known to Clayton may yet be rediscovered in the state. In 1839, Asa Gray, purchasing in London the 2^{d} edition of the *Flora Virginica*, based by Gronovius upon John Clayton's collections, went through the Clayton material (now preserved at the British Museum) and made annotations of the identities. These annotations, added to the citations of Clayton's specimens by Linnaeus, give us Virginia records for hundreds of species; in fact, in the 1st edition of *Species Plantarum* (1753) Linnaeus based 371 species upon Virginian types (largely Clayton's). With the aid of Gray's notes, added to the Linnean references, we know that Clayton collected many of the species which are now most localized in eastern Virginia. These include the following: *Sagittaria subulata, Sacciolepis striata, Eriocaulon decangulare, Tofieldia racemosa, Cleistes divaricata, Ponthieva racemosa, Polygonum glaucum, Arabis virginica, Sarracenia flava* ("Hic vulgo Side sadle flower, in Carolina Boreali Trumpet flower vocatur"—*Clayton*), *Zanthoxylum Clava-Herculis, Ilex decidua, Stewartia Malachodendron, Ludwigia brevipes*,[1] *Lilaeopsis chinensis*

[1] In the 2d edition Gronovius had two species of *Ludwigia* on p. 20. One was *L. alternifolia*, described by Clayton: "Anonymos flore luteo specioso caduco," etc. The other was contrasted with it as follows:

("Hydrocotyle foliis brevioribus, linearibus obtusis"), *Sabatia dodecandra*, *Cynocionum Mitreola* ("Rubia spicata parva alba," etc.), *Buchnera americana*, *Schwalbea americana*, *Erigeron vernus*, *Aster grandiflorus*, *Tetragonotheca helianthoides*, *Krigia Dandelion* and *Prenanthes autumnalis*. It is, therefore, not improbable that the following, discovered in Virginia by Clayton, may be reinstated as present members of the flora: *Smilax lanceolata*, *Burmannia biflora* ("Burmannia aquatica pusilla, flore purpureo pulchro . . . Loca amat paludosa. Floret Septembri. *Clayt. n. 248*"), *Cocculus carolinus*, *Persea Borbonia* (known in Delaware), *Schrankia microphylla* ("Mimosa . . . floribus & siliquis in capitula rotunda congestis"), *Aeschynomene virginica* (known in Delaware and Maryland),[1] *Hypericum denticulatum* (typical), *Marshallia trinervia* ("*Erigeron caule simplicissimo, saepius bifloro, folio caulino semiamplexicaule.*"—Gronovius, ed. 2: 122; identified by Gray as *Marshallia*).

As already emphasized, the species making up the indigenous flora of the Coastal Plain in southeastern Virginia are by no means of uniform occurrence. Many are almost ubiquitous types: *Woodwardia areolata*, *Pinus Taeda*, *Juniperus virginiana*, *Triodia flava*, *Panicum scoparium*, *Tripsacum dactyloides*, *Eleocharis microcarpa*, *Rynchospora cymosa*, *Carex abscondita* Mackenzie, *Juncus setaceus* and *marginatus*, *Smilax rotundifolia* and *glauca*, *Habenaria cristata*, *Saururus cernuus*, *Myrica cerifera*, *Betula nigra*, *Carpinus caroliniana*, *Quercus alba*, *nigra* and *phellos*, *Morus rubra*, *Ulmus americana*, *Phoradendron flavescens*, *Polygonum opelousanum* Ridd. and *setaceum*, *Magnolia virginiana*, *Liriodendron Tulipifera*, *Cercis canadensis*, *Desmodium lineatum*, *Lespedeza Stuevei*, *Centrosema virginianum*, *Polygala incarnata*, *Vitis cinerea* var. *floridana* Munson, *V. rotundifolia*, *Ascyrum stans*, *Hypericum petiolatum*, *Ludwigia alternifolia*, *Jussiaea*

LUDWIGIA caule repente, foliis obverse ovatis petiolatis.

Ludwigia parva aquatica repens: caule succulento glabro rubente: floribus ex alis foliorum egressis dilute luteis, tetrapetalis, fugacissimis, vix conspicuis: foliis rubentibus venosis glabris lucidis, ad finem rotundis, ex adverso binis: vasculo folioso, in quatuor loculamenta diviso. *Clayt. n. 775.*

Asa Gray did not know what to make of it, but marked "Agrees with descr." In view of the occurrence of *L. brevipes* from Cape Henry to False Cape and westward to northern Norfolk County, the identification seems fairly definite.

[1] Most fortunately Clayton, who usually supplied no statement of locality on the specimens which Gronovius and, after him, Linnaeus had, did give for *Aeschynomene* the explicit: "In aquosis ad ripam fluminis Rappahanock Comitu Middlesexiae." Modern specimens from Virginia should soon be available. The beautiful specimen of Clayton's, for a photograph of which I am indebted to Messrs. Ramsbottom and Dandy of the British Museum, shows foliage and fruit.

decurrens, *Nyssa aquatica*, *Cornus stricta*, *Hydrocotyle umbellata*, *Leucothoe racemosa*, *Oxydendrum arboreum*, *Vaccinium stamineum*, *Diospyros virginiana*, *Symplocos tinctoria*, *Fraxinus caroliniana* Mill., *Gelsemium sempervirens*, *Gentiana parvifolia*, *Salvia lyrata*, *Pycnanthemum aristatum*, *Bacopa acuminata*, *Gratiola virginiana* (*sphaerocarpa*), *Mimulus alatus*, *Gerardia virginica* (*flava*) and *G. purpurea*, *Galium obtusum* var. *filifolium* (Wieg.) Fern., *Viburnum nudum*, *Elephantopus nudatus* and *tomentosus*, *Eupatorium capillifolium*, *rotundifolium* and *coelestinum*, *Chrysopsis mariana*, *Solidago odora*, *altissima* and *tenuifolia*, *Sericocarpus linifolius*, *Aster dumosus* var. *coridifolius*, *Baccharis halimifolia*, *Pluchea foetida*, *Gnaphalium purpureum*, *Helianthus atrorubens*, *Helenium tenuifolium*, *Cacalia atriplicifolia*, *Senecio tomentosus*, etc., etc.

The majority, however, are restricted in occurrence, their restrictions varying from local abundance in one or few small areas to single tiny colonies or individuals.[1] In other words, a considerable proportion of the flora has the characteristics of either a relic-flora, left over but not dominating in an area from which it has been largely destroyed, or a pioneering flora which has not succeeded in competition with more aggressive and dominating species. The cases of *Eleocharis Lindheimeri* (MAP 57), *Juncus megacephalus*, *Amianthium muscaetoxicum*, *Hypoxis Longii*, *Hexalectris spicata* (MAP 18), *Clematis ochroleuca*, *Gentiana Porphyrio* and *Houstonia tenuifolia*, already cited, are typical for at least 300 species in eastern Virginia. In order to gain a clear impression of the distinctive components of the flora of this area we may very briefly note the major geographic relationships of the Coastal Plain plants (excluding the strictly maritime species and those of general occurrence both on the Coastal Plain and in the Piedmont). As I at present understand the more noteworthy plants of the Virginian Coastal Plain they fall into seven major groups, five of the groups with parallel subdivisions. The species with only 1–3 very small stations on the Coastal Plain of the state are indicated by an asterisk. Weedy species, such as *Eragrostis hirsuta*, *Aristida oligantha*, *Cenchrus spp.*, *Fimbristylis Baldwiniana*, *Sagina decumbens*, *Arabis virginica*, *Polypremum procumbens* and *Eupatorium capillifolium*, are omitted.

[1] Since the maps were engraved our explorations in September, 1937, have revealed one or more additional stations for many rare species. The southeastern Virginian occurrence is, consequently, not thoroughly displayed in the following MAPS: 2, 10, 11, 13, 14, 15, 26, 30, 31, 32, 34 and 39.

I. Occurring wholly or chiefly on the Embayed Northern Half of the Coastal Plain or Extensions from it (Cape Lookout, North Carolina to Nova Scotia). Such plants as **Dryopteris celsa* (Wm. Palmer) Small, **Panicum mattamuskeetense* var. *Clutei* (Nash) Fern., *P. columbianum* var. *oricola* (Hitchc. & Chase) Fern., *Andropogon virginicus* var. *abbreviatus* (Hackel) Fern. & Grisc., *Cyperus Grayii*, *Eleocharis obtusa* var. *ellipsoidalis* Fern., *E. ambigens* Fern. (map 39) and *E. capitata* var. *typica* Svenson and *var. *pseudoptera* Weatherby, *Scleria minor* (Britton) Stone, **Carex Walteri* Bailey var. *brevis* Bailey, **C. vestita* and **C. Barrattii* Schwein. & Torr. (map 25), **Juncus caesariensis* Coville (map 1), **Cassia nictitans* var. *hebecarpa* Fern., *Hypericum dissimulatum* Bicknell, *Viola Brittoniana*, **V. pectinata*, *Rhexia ventricosa* Fern. & Grisc., **Ludwigia sphaerocarpa* var. *jungens* Fern. & Grisc., *L. brevipes* (Long) E. H. Eames, *Oenothera fruticosa* vars. **humifusa* and **Eamesii*, **Gaylussacia dumosa* var. *Bigeloviana* Fern., *Lycopus americanus* var. *Longii* Benner and **Solidago graminifolia* var. *polycephala* Fern.

To this flora primarily of the Embayed Atlantic Coastal Plain belong, of course, the endemics of eastern Virginia: **Potamogeton capillaceus* var. *atripes* Fern., **Aristida lanosa* var. *macera* Fern. & Grisc., **Panicum lucidum* var. *opacum* Fern., **P. mundum* Fern.,[1] **Psilocarya scirpoides* var. *Grimesii* Fern. & Grisc., **Carex crus-corvi* var. *virginiana* Fern., **Rynchospora trichophylla* Fern., **Xyris torta* var. *macropoda* Fern., **Juncus Griscomi* Fern., *J. Longii* Fern., **Hypoxis Longii* Fern., *Tovara virginiana* var. *glaberrima* Fern., **Geum canadense* var. *brevipes* Fern., **Ammannia Koehnei* var. *exauriculata* Fern., *Bumelia lycioides* var. *virginiana* Fern., **Pycnanthemum pycnanthemoides* var. *viridifolium* Fern., **Bacopa obovata* (Raf.) Fern.,[2] *Diodia teres* var. *hystricina* Fern. & Grisc., **Solidago Elliottii* var. *pedicellata* Fern., **Aster spectabilis* var. *suffultus* Fern., *Gnaphalium calviceps* Fern. and **Rudbeckia hirta* var. *corymbifera* Fern.; and at least eight additional local and as yet undescribed endemics discovered since this went to press.

IA. Like I but with Colonies also on the Appalachian Upland or along the Appalachian Valley. A limited sub-group, which would be considerably extended if some notable species of New Jersey (not yet known in eastern Virginia) were included. In eastern Virginia are *Panicum meridionale* (map 46; also IB), **Helonias bullata* (map 40), **Malaxis Bayardi* Fern., **Parnassia asarifolia* (map 41), *Rubus Enslenii*, *Linum intercursum* Bicknell, *Galax aphylla*, *Lechea racemulosa* (also IB), *Viola Stoneana*, **Sabatia campanulata* (L.) Torr., **Stachys hyssopifolia*, *Chelone Cuthbertii* Small (map 3), **Gerardia decemloba* Greene, **Houstonia tenuifolia*, **Liatris graminifolia* var. *Smallii* (Britton) Fern. & Grisc., *Chrysopsis mariana* var. *macradenia* Fern., *Aster gracilis*, **Gnaphalium obtusifolium* var. *micradenium* Weatherby (see also IB), **Silphium atropurpureum* Retz. (map 42) and **Heliopsis helianthoides* var. *solidaginoides* (L.) Fern.

IB. Like I but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). A small sub-group in Virginia, containing *Panicum meridionale* (map 46) and its var. *albemarlense* (Ashe) Fern. (map 43), *Cardamine pensylvanica* var. *Brittoniana* Farwell, *Lechea racemulosa* (also IA), **Gnaphalium obtusifolium* var. *micradenium* Weatherby (see also IA) and **Bidens coronata* var. *tenuiloba* (Gray) Sherff.

[1] Dr. Blomquist informs me that he has found *Panicum mundum* in North Carolina.

[2] **Bacopa obovata** (Raf.), comb. nov. *Macuillamia obovata* Raf. Aut. Bot. 44 (1840).

II. Confined to the Atlantic Coastal Plain, extending from its Sea-Island Half (south of Cape Lookout) or Extensions from it or from the West Indies or Florida north to Virginia or northward. Such plants as **Sagittaria Weatherbiana* Fern. (map 5), **Triodia flava* var. *Chapmani* (Small) Fern. & Grisc., *Panicum mattamuskeetense* (map 31), **Andropogon ternarius* var. *glaucescens* (Scribn.) Fern. & Grisc., **A. virginicus* var. *glaucopsis* (Ell.) Hitchc., **Cyperus retrorsus* var. *Nashii* (Britton) Fern. & Grisc., *C. filiculmis* var. *oblitus* Fern. & Grisc., *Eleocharis quadrangulata* (typical), **Rynchospora distans* (Michx.) Vahl, *R. Wrightiana* Boeckl. and *R. Torreyana* (map 32), *Carex leptalea* var. *Harperi* (Fern.) Stone, *C. Mitchelliana* M. A. Curtis, **C. bullata* Schkuhr, **Juncus megacephalus, Dioscorea hirticaulis* (map 34), **Malaxis floridana* (Chapm.) Kuntze, **Polygonella polygama* (Vent.) Engelm. & Gray, **Baptisia alba* and *B. tinctoria* (*B. Gibbesii* Small), *Tragia urens* var. *lanceolata, Rhus copallina* (typical), **Gordonia Lasianthus, *Viola esculenta* Ell., *Rhododendron atlanticum* (Ashe) Rehder, **Pyxidanthera barbulata, Fraxinus caroliniana* var. *pubescens* (M. A. C.) Fern., *Asclepias lanceolata* and var. *paupercula* (Michx.) Fern., *Teucrium canadense* (*litorale*), **Trichostema lineare* and **T. dichotomum* var. *puberulum* Fern. & Grisc., **Gerardia racemulosa* and **G. obtusifolia* (Raf.) Pennell, *Galium obtusum* var. *filifolium* (Wieg.) Fern., **Lobelia elongata* Small and **L. glandulosa* Walt., **Carphephorus tomentosus* (Michx.) T. & G. and **C. bellidifolius* (Michx.) T. & G., **Liatris graminifolia* var. *lasia* Fern. & Grisc., *Solidago puberula* var. *pulverulenta* (Nutt.) Chapm., *S. pinetorum* Small and **S. austrina* Small, *Aster subulatus* var. *euroauster* Fern. & Grisc., **Gnaphalium obtusifolium* var. *Helleri* (Britton) Blake and *Arnica acaulis*.

IIA. Like II but with Colonies also on the Appalachian or Ozark Upland. **Carex Collinsii* Nutt. (map 12),[1] **Trillium pusillum* (Ozark Plateau), *Iris prismatica, *Quercus stellata* var. *Boyntoni* (Beadle) Sarg., *Asarum virginicum, *Stewartia pentagyna, Rhexia mariana, *Kalmia angustifolia* var. *caroliniana* (Small) Fern.,[2] *Gratiola viscidula* Pennell (map 10), *Gerardia setacea, *Vernonia glauca, Solidago yadkinensis* (Porter) Small, *Aster grandiflorus* and *A. dumosus* var. *coridifolius* and *Coreopsis verticillata*.

IIB. Like II but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). *Panicum Commonsianum* var. *Addisonii* (Nash) Stone, *Fuirena squarrosa, Scleria pauciflora* var. *caroliniana* and *Carex alata*. Doubtless others.

III. On the East Gulf Coastal Plain (eastern Louisiana and Mississippi to southwestern Georgia or northwestern Florida) and the Sea-Island Half of the Atlantic Coastal Plain, extending north to Virginia or beyond. Such species as **Pinus serotina, *Taxodium adscendens* Brongn., *Chamaecyparis thyoides, Sagittaria latifolia* var. *pubescens, Calamagrostis cinnoides, *Agrostis elata* Pursh (map 30), **Panicum caerulescens, P. Wrightianum* Scribn. (map 13) and *P. Commonsianum, *Andropogon Elliottii* var. *gracilior* Hackel, **Eleocharis vivipara* Link, *Lipocarpha maculata, *Rynchospora dodecandra* Baldw.,

[1] Mr. Neil Hotchkiss kindly calls my attention to a station in Prince Georges County, Maryland, omitted from map 12.

[2] On p. 437 the spelling *carolina*, which Small first used, was followed. However, on his p. 1336 he changed to caroliniana, the spelling which, since it accompanied the citation of the type, should prevail.

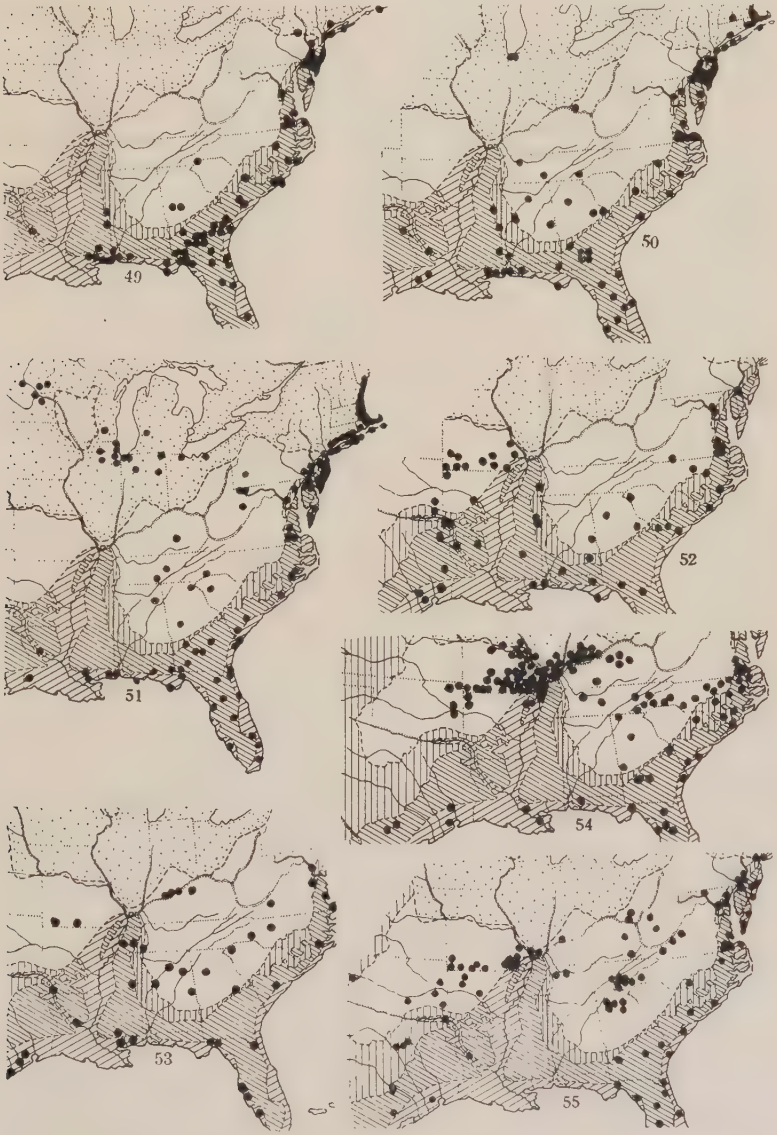
Scleria nitida Willd., **Xyris Curtissii* Malme, **Juncus abortivus* Chapm. (MAP 28), **Zigadenus glaberrimus, Smilax tamnifolia, Zephyranthes Atamasco, Sisyrinchium arenicola, *Ponthieva racemosa* (Walt.) Mohr, *Myrica Curtissi* Cheval., *Quercus stellata* var. *Margaretta* (Ashe) Sarg. and **Q. laevis* Walt., **Arenaria caroliniana* (MAP 29), *Nuphar fluviatile* (Harper) Standl., **Asimina parviflora* (Michx.) Dunal, *Sarracenia purpurea* var. *venosa* (Raf.) Fern., **Wisteria frutescens* (MAP 44), **Desmodium rhombifolium* (Ell.) DC., **Polygala Harperi* Small, *P. Nuttallii* and *P. lutea* (MAP 45), **Ilex coriacea* (Pursh) Chapm., *Kosteletzkya virginica, *Stewartia Malachodendron, *Hypericum setosum* L., **Ammannia Koehnei, Rhexia mariana* var. *purpurea* Michx. (*R. Nashii* Small), *Proserpinaca palustris* (*P. platycarpa* Small), **Leucothoe axillaris, Lyonia ligustrina* var. *foliosiflora* and *L. lucida* (Lam.) C. Koch, **Osmanthus americanus* (L.) Benth. & Hook., **Sabatia Elliottii, *S. dodecandra, *S. difformis* (L.) Druce (*S. lanceolata* T. & G.) and *S. paniculata, Gentiana parvifolia* (Chapm.) Britton, **Hydrolea quadrivalvis, Lippia lanceolata, Pycnanthemum aristatum* and var. *hyssopifolium*, **Utricularia virgatula* and **U. juncea*, **Dyschoriste oblongifolia, *Eupatorium cuneifolium* Willd., *Solidago fistulosa* and *S. caroliniana* (L.) BSP., *Gnaphalium obtusifolium* var. *praecox* Fern., *Polymnia Uvedalia* var. *floridana* Blake, *Silphium compositum* Michx., **Marshallia trinervia, *Helianthus Schweinitzii* T. & G., **Coreopsis delphinifolia* and **C. gladiata* Walt., **Bidens mitis* (Michx.) Sherff, **Cirsium Nuttallii* (DC.) Gray and *Prenanthes autumnalis* Walt.

IIIA. LIKE III BUT WITH COLONIES ON THE APPALACHIAN OR THE OZARK UPLAND. *Orontium aquaticum, *Habenaria blephariglottis* var. *conspicua* (MAP 27), **Cleistes divaricata* (L.) Ames (MAP 2), **Asarum arifolium, Sarracenia flava, Lechea Leggettii* (also IIIB), **Monotropsis odorata, Penstemon australis* Small, *Lobelia glandulifera* (Gray) Small (MAP 20), and *L. Nuttalli, Eupatorium album* (MAP 35), *Liatris graminifolia* and **Tetragonotheca helianthoides.*

IIIB. LIKE III BUT WITH ISOLATED COLONIES NEAR OR ABOUT THE GREAT LAKES (CHIEFLY LAKE MICHIGAN). *Aristida tuberculosa, Panicum virgatum* var. *cubense* and *Lechea Leggettii* (also IIIA).

IV. ON THE GULF COASTAL PLAIN BOTH EAST AND WEST (TEXAS, ARKANSAS OR WESTERN LOUISIANA TO SOUTHWESTERN GEORGIA OR NORTHWESTERN FLORIDA) AND THE SEA-ISLAND HALF OF THE ATLANTIC COASTAL PLAIN, EXTENDING NORTH TO VIRGINIA OR BEYOND. The largest element in the flora, consisting in part of **Pinus palustris* and *P. Taeda*, **Typha truxillensis* HBK., *Sagittaria falcata* Pursh, *Arundinaria tecta, Eragrostis refracta, *Uniola sessiliflora* Poir., *Danthonia sericea, *Sporobolus virginicus, *Ctenium aromaticum* (MAP 11), **Leersia hexandra, Paspalum distichum, *P. setaceum* var. *supinum* (Bosc) Trin. and *P. Boscianum*, **Panicum longifolium* var. *Combsii* (Scribn. & Ball) Fern., **P. anceps* var. *rhizomatum* (Hitchc. & Chase) Fern., **P. strigosum, P. aciculare, P. consanguineum* (MAP 47), *P. roanokense*, **P. longiligulatum, P. albomarginatum, P. trifolium*, **P. ensifolium, P. lancearium*, **P. mutabile* (MAP 15) and *P. scabriusculum, Sacciolepis striata, Axonopus furcatus, Erianthus contortus*, **Sorghastrum Elliottii* (Mohr) Nash, **Andropogon Mohrii* and *A. virginicus* var. *tenuispatheus* (Nash) Fern. & Grisc., **Cyperus haspan* var. *americanus* Boeckl., *C. sabulosus* Mart. & Schrad., **C. retrorsus* var. *Deeringianus* (Britt. & Sm.) Fern. & Grisc., *C. hystricinus*, **Eleocharis albida* and *E. tortilis*, **Dichromena colorata, Rynchospora gracilenta, R.*

Map 31, range of Panicum mattamuskeetense; 32, Rynchospora Torreyana; 33, Juncus diffusissimus; 34, Dioscorea hirticaulis; (for maps 35–38 see Eupatorium in Part II); 39, Eleocharis ambigens; 40, Helonias bullata; 41, Parnassia asarifolia; 42, Silphium atropurpureum; 43, Panicum meridionale var. albemarlense; 44, Wisteria frutescens; 45, Polygala lutea; 46, Panicum meridionale; 47, Panicum consanguineum; 48, Arenaria lanuginosa (northern half of range).



Map 49, range of Lycopodium alopecuroides (northern area); 50, Panicum verrucosum; 51, Polygala cruciata including the southern var. cuspidata; 52, Panicum Ravenelii; 53, Scleria oligantha; 54, Ulmus alata; 55, Clitoria mariana.

microcephala, **R. fascicularis* (Michx.) Vahl, *R. rariflora*, **R. cymosa* var. *globularis* Chapm., *R. caduca* and *R. inexpansa*, **Cladium jamaicense* Crantz, **Scleria ciliata*, *Carex styloflexa*, **C. crebriflora* Wieg., **C. venusta* var. *minor*, *C. glaucescens* Ell. and *C. folliculata* var. *australis* Bailey, *Xyris ambigua* Beyr., **X. platylepis* Chapm., *X. difformis* and **X. flexuosa* (*arenicola*), **Eriocaulon decangulare* and **E. compressum*, **Pontederia lanceolata* Nutt., *Tillandsia usneoides*, *Juncus repens*, **J. polycephalus* Michx., *J. Elliottii* Chapm., *Tofieldia racemosa*, **Aletris aurea*, *Smilax laurifolia*, *S. Walteri*, **Hypoxis sessilis* L., **H. micrantha* Pollard, **Burmannia biflora*, *Habenaria cristata*, *Myrica cerifera*, *Quercus virginiana*, **Q. rhombica* Sarg. and **Q. cinerea* Michx., *Paronychia Baldwinii* (T. & G.) Chapm., **Arenaria lanuginosa* (Michx.) Rohrb. (map 48), *Persea palustris* (Raf.) Sarg., **P. Borbonia*, *Drosera capillaris* Poir., **D. brevifolia*, *Decumaria barbara*, **Schrankia microphylla*, **Crotalaria Purshii*, **C. rotundifolia*, *Tephrosia spicata*, **Baptisia villosa*, **Zornia bracteata*, **Desmodium tenuifolium* T. & G., *Rhynchosia erecta*, **Galactia Macreei*, *Zanthoxylum Clava-Herculis*, **Polygala ramosa*, *Cnidoscolus stimulosus*, *Cyrilla racemiflora*, *Ilex vomitoria*, *Vitis cinerea* var. *floridana* Munson,[1] **Ascyrum Hypericoides* (typical).[2] *Hypericum nudiflorum*, *Viola emarginata* and **V. lanceolata* var. *vittata* (Greene) Weath. & Grisc., *Lythrum lineare* and **L. lanceolatum* Ell., **Rhexia ciliosa*, *Ludwigia hirtella*, *L. linearis*, **L. pilosa* Walt. and **L. alata* Ell., *Hydrocotyle Canbyi*, *H. verticillata* and *H. ranunculoides*, *Centella repanda* (Pers.) Small, **Sanicula canadensis* var. *floridana* (Small) H. Wolff, *Eryngium aquaticum*, *Nyssa sylvatica* var. *biflora* (Walt.) Sarg. and var. *dilatata* Fern., *Gaylussacia dumosa* (typical), *Vaccinium Elliottii*, *Gelsemium sempervirens*, **Cynoctonum Mitreola*, *Sabatia calycina*, *Gentiana villosa*, **Bartonia verna*, *Dichondra repens* var. *carolinensis* (Michx.) Choisy, *Breweria humistrata*, **Verbena scabra* Vahl, **Physalis maritima* M. A. Curtis, *Bacopa acuminata* (Walt.) Robinson, **B. Monnieria* var. *cuneifolia* (Michx.) Fern., **Micranthemum umbrosum* (Walt.) Blake (map 8), *Utricularia subulata*, **Justicia ovata* Walt., **Oldenlandia Boscii* (DC.) Chapm., *Galium uniflorum* Michx., *G. hispidulum*, *Elephantopus nudatus*, **Eupatorium leucolepis*, *E. rotundifolium* and var. *lanceolatum* (Muhl.) Fern. & Grisc. (*E. verbenaefolium*), *Chrysopsis graminifolia* and var. *aspera* (Shuttlew.) Gray, *Solidago tortifolia*, *Aster concolor*, **Erigeron vernus*, *Baccharis halimifolia*, *Senecio tomentosus* and *Cirsium horridulum*.

IVA. Like IV but with Colonies on the Appalachian or the Ozark Upland. *Woodwardia areolata*, *Lycopodium alopecuroides* (map 49), **Panicum hemitomon* (map 14),[3] *Aristida virgata* (map 26), *Eleocharis microcarpa* Torr. (incl. var. *filiculmis* Torr. (*E. Torreyana*), see also IVB) and *E. tuberculosa*, *Lachnocaulon anceps*, *Centrosema virginianum*, *Lechea minor* (also IVB), *Ascyrum stans*, *Symplocos tinctoria*, *Bartonia paniculata* *Gratiola pilosa*, **Seymeria cassioides* (Walt.) Blake (map 24), *Schwalbea americana* (map 23), *Viburnum scabrellum* Chapm., *Eupatorium album* var. *glandulosum* (Michx.) Fern. (map 36), *E. aromaticum* and *E. rotundifolium*

[1] See Rhodora, xxxviii. 426 (1936).

[2] See Rhodora, xxxviii. 432 (1936).

[3] Since map 14 was published I have learned through Mr. Neil Hotchkiss that "*Panicum hemitomon* has within the past two years been found in the Blue Ridge in Augusta County, Virginia, and on the Cumberland Plateau, Grundy County, Tennessee."

var. *ovatum* (Bigel.) Torr. (*E. pubescens*) and *Solidago ludoviciana* (Gray) Small.

IVB. Like IV but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). *Woodwardia areolata* (also IVA), *Panicum verrucosum* (map 50), *P. lucidum* and *P. auburne*, *Eleocharis microcarpa* Torr. (also IVA), *Carex Longii* Mackenz., *Lechea minor* (also IVA), *Polygala cruciata* (map 51)[1] and *Hydrocotyle umbellata*.

V. On the Gulf Coastal Plain both East and West, extending inland toward or beyond the Head of the Mississippi Embayment into eastern Missouri, southern Illinois or western Kentucky and sometimes up the Mississippi, Missouri or Ohio into Iowa, Illinois, Indiana or Ohio; also on the Sea-Island Half of the Atlantic Coastal Plain, extending north to Virginia or beyond. The second largest element in the flora, consisting, in part, of *Polypodium polypodioides*, *Pinus echinata*, *Taxodium distichum*, *Echinodorus radicans* (map 16), **E. tenellus*, **Limnobium Spongia*, *Arundinaria gigantea*, *Festuca sciurea*, *Eragrostis hirsuta*, **Triodia stricta*, *Agrostis hyemalis* (Walt.) BSP.,[2] **Muhlenbergia capillaris*, *Aristida lanosa*, *Leptochloa filiformis*, *Gymnopogon ambiguus*, *Phalaris caroliniana*, **Paspalum dissectum*, *P. laeve* and vars., *P. floridanum*, *P. setaceum* and *P. ciliatifolium*, **Panicum hians*, *P. anceps*, *P. laxiflorum* (incl. *P. xalapense*), **P. nitidum* and **P. annulum*, *Erianthus alopecuroides*, *E. giganteus*, *Andropogon ternarius*, **A. virginicus* var. *tetrastachyus*, *A. Elliottii*, **Cyperus paniculatus* Rottb. and *C. dipsaciformis*, *Rynchospora corniculata* and *R. cymosa*, *Scleria ciliata* var. *Elliottii* (Chapm.) Fern., *Carex stipata* var. *maxima* Chapm. (*C. uberior*), *C. amphibola*, **C. flaccosperma* Dewey, **C. oxylepis*, *C. debilis*, *C. Joorii* Bailey, *C. louisianica* Bailey and *C. gigantea*, *Lemna valdiviana* and *L. perpusilla*, *Wolffiella floridana*, *Commelina virginica* (*hirtella*), *Heteranthera reniformis*, *Juncus setaceus*, *J. biflorus* Ell. and *J. debilis*, **Amianthium muscaetoxicum*, *Smilax Bona-nox*, **Hypoxis leptocarpa* (map 7), **Dioscorea quaternata* and *var. *glauca*, *Salix longipes* Anderss. var. *Wardii* (Bebb.) Schneider, *Carya aquatica*, *Carpinus caroliniana* (typical),[3] *Quercus lyrata*, *Q. Prinus* (*Michauxii*), *Q. falcata*, *Q. nigra* and *Q. phellos*, *Celtis laevigata* Willd., *Polygonum opelousanum* Riddell and **P. densiflorum* Meisn., **Cabomba caroliniana*, *Ranunculus oblongifolius* and *R. pusillus*, *Clematis crispa*, **Cocculus carolinus*, *Itea virginica*, *Crataegus Phaenopyrum* and *C. Marshallii* Egglest., *Rubus trivialis*, *Desmodium ochroleucum* and *D. lineatum*, *Galactia regularis*, *Rhynchosia tomentosa*, *Strophostyles umbellata*, **Linum floridanum* (excl. *intercursum*),[4] *Polygala Curtissii*, **Crotonopsis elliptica* Willd., *Vaccinium arboreum*, *V. virgatum* var. *tenellum*, **Styrax americana*, **S. grandifolia*, *Fraxinus caroliniana*, *Chionanthus virginica*, *Sabatia brachiata*, *Euphorbia Ipecacuanhae*, **Stillingia sylvatica*, **Callitriche Austini*, *Ilex decidua*, *Berchemia scandens*, **Ampelopsis arborea*, *Ascyrum Hypericoides* var. *oblongifolium* (Spach) Fern., **Hypericum denticulatum* var. *ovalifolium* (Britton) Blake, *H. petiolatum* and *var. *tubulosum* (Walt.) Fern.[5] *Lud-*

[1] Much of the material from Florida to Mississippi, north into the mountains of Kentucky, is var. *cuspidata* (H. & A.) Wood (*P. ramosior* (Nash) Small).

[2] Excluding the more northern and later-flowering *A. scabra* Willd. See Rhodora, xxxv. 207, pl. 246, figs. 1 and 2 (1933).

[3] See Rhodora, xxxvii. 424, t. 394 (1935).

[4] See Rhodora, xxxvii. 430, t. 396, figs. 11–14 (1935).

[5] See Rhodora, xxxviii. 426 (1936).

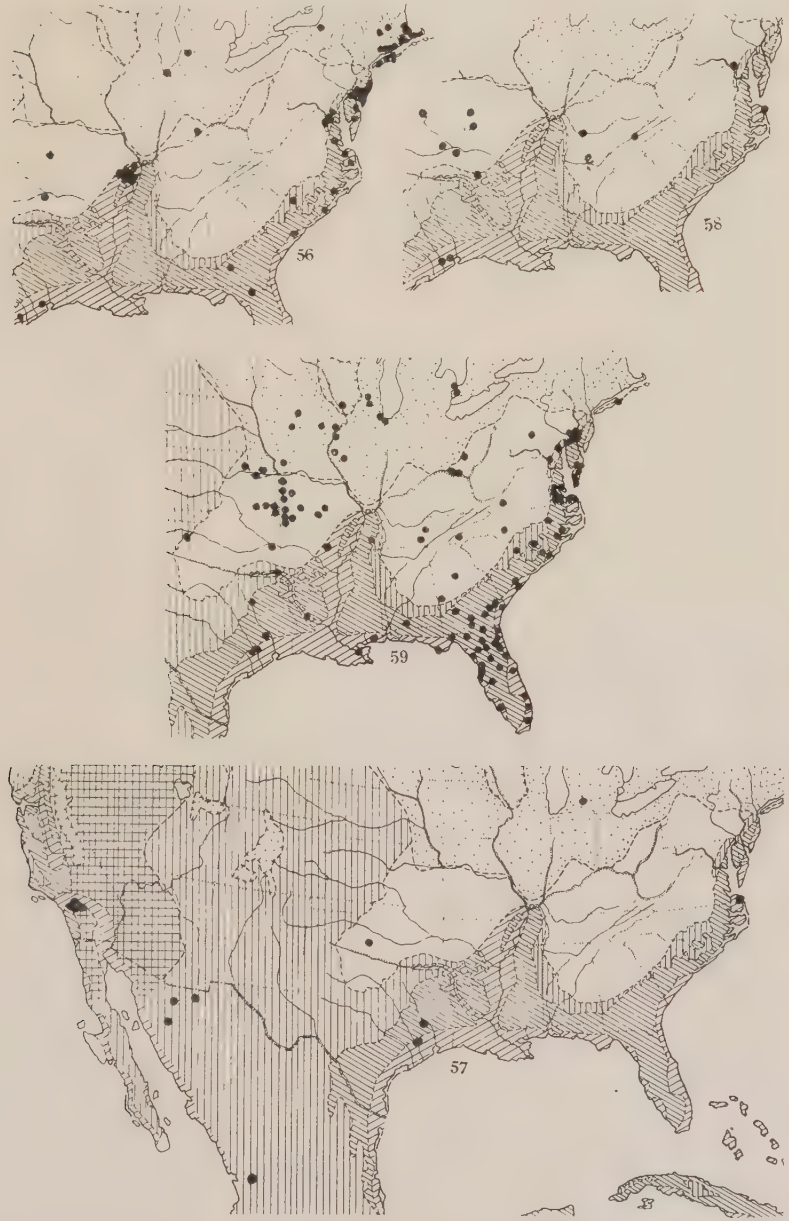
*wigia glandulosa, Myriophyllum pinnatum, Ptilimnium capillaceum, Nyssa aquatica, Cornus stricta, Lyonia mariana, *Fraxinus profunda, Trachylospermum difforme, Asclepias variegata* and **A. rubra, *Verbena canadensis, *Lippia nodiflora, Callicarpa americana, Scutellaria integrifolia, Physostegia denticulata, Salvia lyrata, *Pycnanthemum albescens, Oldenlandia uniflora, Diodia virginiana, Viburnum rufidulum, Melothria pendula, Elephantopus tomentosus, *Eupatorium incarnatum* and *Cirsium virginianum.*

VA. Like V but with Colonies on the Appalachian or Ozark Upland. **Paspalum fluitans* (map 17), *Panicum Ravenelii* (map 52), *Scirpus divaricatus* (map 4), **Scleria oligantha* (map 53), *Xyris torta* J. E. Sm. (see also VB), **Juncus diffusissimus* (map 33), *Smilax glauca, *Hexalectris spicata* (map 18), *Castanea pumila, Quercus marilandica, Ulmus alata* (map 54), *Phoradendron flavescens, *Ranunculus palmatus* Ell., *Sanguinaria canadensis* var. *rotundifolia* (Greene) Fedde (Ozarks), *Desmodium laevigatum, Galactia volubilis, Clitoria mariana* (map 55), *Phyllanthus carolinianus, Gentiana Saponaria, *Obolaria virginica, Rhus Toxicodendron (quercifolia), Ilex opaca, Aesculus Pavia, Ascyrum Hypericoides* var. *multicaule* (Michx.) Fern., *Hypericum gymnanthum, Passiflora lutea* and *P. incarnata, *Nyssa sylvatica* var. *caroliniana, *Onosmodium virginianum, Campsis radicans* (L.) Seem. (*Tecoma*), *Bignonia capreolata, Diodia teres, Viburnum nudum, Elephantopus carolinianus, Eupatorium cuneifolium* var. *semiserratum, Liatris squarrosa, Chrysopsis mariana, Solidago erecta, S. rugosa* var. *celtidifolia* (Small) Fern. and **S. nemoralis* var. *Haleana* Fern., *Erigeron ramosus* var. *Beyrichii, Pluchea foetida* and *P. viscida* (Raf.) House (*petiolata*), *Gnaphalium purpureum, Rudbeckia laciniata* var. *humilis, Helianthus atrorubens* and *H. angustifolius, Bidens laevis* and *Krigia Dandelion.*

VB. Like V but with isolated Colonies near or about the Great Lakes (chiefly Lake Michigan). **Panicum spretum, Fuirena hispida, *Rynchospora macrostachya* (map 56), **Scleria setacea* Poir., *Xyris torta* (see VA), *Juncus scirpoides, Polygonum setaceum, *Hottonia inflata.*

VI. Primarily on the Gulf Coastal Plain, with only local Colonies on the Atlantic Coastal Plain or its Extensions. **Cyperus Halei* Torr., **Rynchospora Harveyi* W. Boott, *Stylosanthes biflora* var. *hispidissima, *Aesculus discolor* Pursh, *Viola affinis* var. *chalcosperma* (Brainerd) Griscom, **Lysimachia radicans* Hook., **Cephalanthus occidentalis* var. *pubescens* and **Triosteum angustifolium.*

VII. Primarily of the Interior of the Continent, often of the Prairie Region or Bottomlands northwest or west of the Appalachian Upland and prevailingly north of the Gulf Coastal Plain or in rich Areas of the North; isolated often by the Appalachian Upland or from the North in Areas on the Atlantic Coastal Plain or its Extensions. *Festuca paradoxa* Desv. (map 6), **Leersia lenticularis* (map 22), **Cyperus Engelmanni, *Eleocharis Lindheimeri* (Clarke) Svenson (map 57), **Carex crus-corvi* (incl. var. *virginiana;* see map 9), **C. decomposita, *C. Frankii, C. typhina, C. squarrosa* and **C. Grayii* (map 19), **Wolffia punctata, *Juncus brachycarpus* (map 21), **Smilax herbacea,* var. *lasioneuron* (Hook.) A. DC., **Dioscorea villosa, *Spiranthes ovalis* (at the junction of the Coastal Plain and the Piedmont), **Quercus velutina* var. *missouriensis* Sarg., **Iresine rhizomatosa* Standley (map 58), **Magnolia tripetala, *Gillenia trifoliata* and **G. stipulata,*



Map 56, range of Rynchospora macrostachya; 57, Eleocharis Lindheimeri; 58, Iresine rhizomatosa; 59, Polygala incarnata (excluding Mexican area).

Psoralea psoralioides (Walt.) Cory (perhaps better in VA), **Lespedeza acuticarpa*, **Lathyrus venosus*, *Polygala incarnata* (MAP 59), **Viola villosa*, **Buchnera americana*, *Symphoricarpus orbiculatus*, **Kuhnia eupatorioides* and **Solidago gymnospermoides*.

A great number of these plants, it must be again emphasized, are highly localized on the Coastal Plain of Virginia, with only one to three known and usually very small stations. Scharff tellingly says of Bermuda, "it is manifest that although that most destructive of all creatures, 'man', has played havoc with the native animals and plants, largely exterminating them, a recognizable residue has survived from remote times;"[1] so in eastern Virginia some remnants are left to throw light on their probable geographic history. In the present discussion one may pass groups I–V as typical Coastal Plain plants which are to be expected. Groups VI and VII and subgroups A and B under I–V are the more interesting; and, were we to take in the Coastal Plain flora northward to Long Island and southward into the Carolinas, several very striking additions to these isolated floras would be recorded.

The members of subgroups IA to VA, with colonies on the Appalachian Upland (or sometimes the Ozark Upland), are probably more numerous than here indicated. Every serious exploration in these areas brings new cases to attention and I have doubtless wrongly classified a great many. These plants are of peculiar interest because, occurring on the old and now elevated core of eastern North America, they seem to be true relics of the Cretaceous or early Tertiary flora which, upon the elevation of the old Cretaceous peneplain from its sea-level status, partially moved outward to the newly available Coastal Plain. This general situation has been discussed or outlined several times and more and more the evidence accumulates that many species now characteristic of the Coastal Plain were formerly on the ancient core of eastern North America, in our latitude the Appalachian and Ozarkian Uplands.[2] Some students maintain that Coastal Plain species are moving into the ancient uplands. They may be right in this interpretation. In general, however, it seems to me more probable that plants and animals of long-established and conservative groups should have moved out from the ancient lands during pro-

[1] Scharff, Distribution and Origin of Life in America, 194 (1912).

[2] See in this connection Fernald, *Specific Segregations and Identities in some Floras of Eastern North America and the Old World*, RHODORA, XXXIII. 25–63 (1931)—Contrib. Gray Herb. no. XCIII; and Braun, *Some Relationships of the Flora of the Cumberland Plateau and Cumberland Mountains in Kentucky*, RHODORA, XXXIX. 193–208 (1937).

nounced changes due to uplift and have entered the newer or younger areas as they became available for occupation, than that groups already conservative should have arisen upon the very young areas and then have intruded themselves successfully into the old regions where ancient series of species were already in possession. For example, in 1931, I cited "*Cleistes divaricata* (*Pogonia divaricata*), . . . a typical species of the Coastal Plain, . . . well known from high tablelands of the southern Appalachians"[1] and included it among species with relic colonies in the ancient area. Pennell, however, doubts its antiquity on the Appalachian Upland, saying:

> There can be no doubt that among the many illustrations cited by Professor Fernald many must be representatives of this ancient flora. Thus, *Amianthium*, *Xerophyllum*, and *Helonias* have all the expected features of ancient genera, few species, small or widely disrupted ranges, while all belong to tribes of the Liliaceae that show the primitive features of three distinct styles and septicidal dehiscence of the capsule; also, none of these have special mechanism for rapid seed-dispersal. But when upon the same list of characteristically Coastal Plain genera that occur also on the "high Appalachian crests and tablelands" we note *Calopogon* and *Cleistes*, genera with the highly modified floral structure of the Orchidaceae and seeds fitted by their minute size for carriage to long distances by wind, we can but ask whether these may not have passed inland from the lowland to the highland, at a relatively recent time. Certain it is that our study of the relations of the southern Appalachians and Coastal Plain has shown that migration may occur in either direction.[2]

Just why *Cleistes* (MAP 2) is so youthful a plant that, before the tilting off of the Miocene sea from the continental margin, it could not have been on the Appalachian core, Pennell does not make clear. It belongs to a group of the *Orchidaceae* which surely antedates the availability to plants of the Coastal Plain. Its own immediate alliance, the plants which have long been treated as *Pogonia*, has *Pogonia* itself geographically segregated between Atlantic North America and eastern Asia, while other members of its tribe are in Australia and other regions with most ancient floras.

In view of Pennell's belief that *Cleistes* is too recent a plant to have moved from the old land to the young Coastal Plain, it is at least significant that Small, in his *Manual* (1933) should have selected this monotype as the one illustration he gives of a movement out from the mountains to the coast! Discussing *Cleistes divaricata*, Small (p. 375)

[1] Fernald, l. c. 40 (1931).
[2] Pennell, Scroph. E. Temp. N. Am. 588, 589 (1935).

writes: "After the seas which deposited the Coastal Plain strata retreated, this plant spread to the seacoast, but still maintained a foothold in the mountains." Again (Addisonia, xviii. 39) he says: "*Cleistes* is perhaps a very ancient type. Its altitudinal range indicates a migration from the ancient highlands where it still maintains a foothold." It is also significant that in Kentucky, Professor Lucy Braun should find that "*Pogonia* (*Cleistes*) *divaricata* . . . is found near the headwaters of the Cumberland River between Pine and Black Mountain . . . and at the western margin of the Cumberland Plateau . . . on sandstone knobs or monadnocks of the undissected portions of the plateau, which are remnants of the Cumberland Peneplain. All three stations are far removed from the Coastal Plain and from the Southern Appalachians. *Schwalbea australis* Pennell [which on p. 448 I have shown to be really inseparable from *S. americana;* see MAP 23] is another Coastal Plain species found with *Cleistes* on the monadnocks of the Cumberland Plateau . . . and one which is a pronounced disjunct."[1] Professor Braun further shows, quoting chiefly from the physiographer, Fenneman, that "The last base-level which was general over this area—*except* for *certain* monadnocks—was that known as the Schooley or Cumberland Peneplain. . . . physiographers now date it as 'not older than Miocene'"[2]; and, considering the possibility of migration from or to the Coastal Plain, she concludes that "The occurrence of the other species [other than *Itea virginica* and *Quercus phellos*, which she thinks might have moved up from the Mississippi embayment] on undissected remnants of the plateau or on monadnocks and their wide separation from the general area of their ranges, point to the relic interpretation."[3] Incidentally, Pennell, commenting on the disrupted range of *Chelone Cuthbertii* (Coastal Plain of Virginia, mountains and Appalachian Valley of North Carolina; see MAP 3) feels that "its apparent local occurrence in such diverse environments suggests considerable antiquity."[4]

It is, of course, probable that some species of the Coastal Plain have moved up the valleys into the upland; but such upland species as *Trillium pusillum*, *Parnassia asarifolia* (MAP 41), *Stewartia pentagyna*, *Galax aphylla*, *Houstonia tenuifolia*, *Lobelia glandulifera* (MAP

[1] Braun, l. c. 197, 198 (1937).
[2] Braun, l. c. 201.
[3] Braun, l. c. 204.
[4] Pennell, l. c. 181.

20), *Silphium atropurpureum* (MAP 42) and many others with only solitary or few stations on the Coastal Plain seem to be parallel with *Cleistes divaricata* (MAP 2), species which have ventured from the upland very slightly into the lowland area or which, coming slightly down to the coast, have not been able there to dominate the flora. Logically, furthermore, others, like *Orontium aquaticum, Linum intercursum, Sabatia campanulata, Chelone Cuthbertii* (MAP 3), etc., which southward take to the upland but northward are chiefly on the Coastal Plain, seem also to have moved toward the coast from the mountains. Returning for a moment to *Cleistes divaricata,* since that species has become the text, so to speak, it is notable that at least north of Florida on the Coastal Plain the plant nowhere shows that reproductive capacity and pioneering tendency which is so evident in many youthful plants and in those newly in possession of virgin habitats. From the northern end of its range we get this statement regarding it (as *Pogonia divaricata*):

"This splendid Orchid was apparently first collected in the State by D. C. Eaton, at Batsto (in 1860?), and again July 7, 1864, at Quaker Bridge, by W. H. Leggett. From that time on there is no evidence of its having been found in New Jersey until June 30, 1909, when the writer discovered a small colony of plants near Bennett, Cape May Co., N. J. These specimens were not growing out in the wet bog where *P. ophioglossoides* abounded, but in a dryer spot near the edge, well concealed among various sedges, grasses, etc. They bloomed again in 1910 and produced seed, although the farmer's scythe passed within a couple of feet of them and they narrowly escaped being transformed into hay."—W. Stone, Pl. So. N. J. 371 (1912).

At the only Virginia station known[1] prolonged search might show eight or ten very isolated individuals. Proceeding to Georgia, we find the outstanding authority on that state saying "not common . . . Rarely as many as a dozen specimens can be seen at one time." R. M. Harper, Phytogeogr. Sketch Altamaha Grit Reg.—Ann. N. Y. Acad. Sci. xvii. 254 (1906). Its scarcity on the Coastal Plain north of Florida, although suggesting that it is there also a relic (or relict) does not suggest that it has recently been invading the mountains from these weak and scattered coastal stations.

Similarly, the plants of subgroups IB–VB, with colonies in northern

[1] Another station with three individuals was found in September, 1937.

Indiana or other areas near Lake Michigan, seem, as emphasized by me in 1931 (Fernald, l. c.) to be species which originally moved out from the old Appalachian centers both northwestward and eastward or southward. Some of the species, like *Woodwardia areolata*, *Fuirena squarrosa* and *Xyris torta*, still have relic-colonies on the mountains. Others have no known upland stations, but almost every year limited colonies of additional species of subgroups B are being found in the upland.

Group VI, consisting of a few plants which occur primarily on the Gulf Coastal Plain or its extensions northward, but east and northeast of southwestern Georgia or northwestern Florida are highly localized, may eventually be merged with Groups V and VII. Most of the plants of the group are rather technical species or varieties which may eventually be found in the region between Virginia or adjacent North Carolina and northwestern Florida. *Juncus diffusissimus* (MAP 33), for instance, although, according to Small, extending eastward only to Georgia, was collected in Florence and Berkeley Counties, South Carolina, by Wiegand and Manning (nos. 751 and 752) in 1927, and even in southeastern Virginia (no. 750).

Group VII is the most interesting and least explicable element in the flora, plants of the rich valleys, bottomlands or other habitats of the interior, but sometimes of the North, isolated, often by hundreds of miles, in southeastern Virginia. *Carex crus-corvi* (MAP 9), with its Virginian variety hundreds of miles removed from the primary area of the species, is typical of the group. *Eleocharis Lindheimeri* (MAP 57), has a single small area (False Cape) in Virginia; otherwise its eastern limits are in Michigan and in Texas. Similarly, *Solidago gymnospermoides*, characteristic of a thicket bordering salt marsh in Northampton County, is primarily a species of sands and prairies from Minnesota to Louisiana and westward. Others, like *Juncus brachycarpus* (see p. 346 and MAP 21), have a few upland stations; while the oxylophytic *Buchnera americana* is primarily on the Appalachian and Ozarkian Uplands, with relatively few stations in the lowland. Some of the species of Group VII are, then, clearly such as have radiated out of the ancient Appalachian or Ozarkian Uplands. Others, especially the plants of rich, calcareous alluvium, belong more clearly in the prairie-bottomland flora. Whether the ranges of these species are actually so disrupted as they now seem may well be doubted. Exploration of the calcareous bottoms on or

near the Coastal Plain of the Carolinas may show their seemingly isolated eastern stations to connect, interruptedly, with the bottomland stations of the interior. Here is a real challenge to those who are situated to carry on field-work in the Carolinas. The plants of the rich interior bottoms, having found the valleys of the Meherrin, Nottoway, or other streams in southeastern Virginia, are there able to thrive, as pointed out in the opening paragraphs, side-by-side with oxylophytes, apparently because of the layer of Miocene shells which occurs only slightly beneath the surface. Farther south, where the calcareous and acid soils are similarly intermixed the same floristic conditions are likely to be found.

Explanation of Plates 474–487

Plate 474. Paspalum repens Bergius. Figs. 1–3, summits of leaf-sheaths, × 2: fig. 1, from Central Paraguay, *Morong*, no. 282; fig. 2, from Pará, Brasil, July 17, 1935, *Stillman Wright;* fig. 3, from Caicara, Venezuela, *Haman*, no. 4. Figs. 4 and 5, spikelets, × 10: fig. 4, from same plant as fig. 1; fig. 5, from same plant as fig. 2.

P. fluitans (Ell.) Kunth. Figs. 6–10, summits of leaf-sheaths, × 2: fig. 6, from Jasper, Missouri, September 16, 1908, *E. J. Palmer;* fig. 7, from Oquawka, Illinois, *Patterson;* fig. 8, from Decker, Indiana, *Deam* in Amer. Gr. Nat. Herb., no. 902; fig. 9, from Courtland, Virginia, *Fernald & Long*, no. 6460; fig. 10, from Istachatta, Florida, *A. H. Curtiss*, no. 5970. Figs. 11–13, spikelets, × 10: fig. 11, from same plant as fig. 10; fig. 12, from same plant as fig. 7; fig. 13, from same plant as fig. 9.

Plate 475. Rynchospora trichophylla, n. sp.: fig. 1, portion of plant, × ⅔, from 4 miles northwest of Homeville, Virginia, *Fernald & Long*, no. 6063 (type); fig. 2, inflorescence, × 2, from type; figs. 3 and 4, achenes, × 20, from type.

R. filifolia Torr.: fig. 5, inflorescence, × 2, from isotype, North Carolina, *M. A. Curtis;* fig. 6, achene, × 20, from isotype.

R. Wrightiana Boeckl.: fig. 7, inflorescence, × 2, from Littleton, Virginia, *Fernald & Long*, no. 6085; fig. 8, achene, × 20, from no. 6085.

R. fuscoides C. B. Clarke; fig. 9, inflorescence, × 2, from Jacksonville, Florida, *A. H. Curtiss*, no. 4874; fig. 10, achene, × 20, from no. 4874.

Plate 476. Carex crus-corvi Shuttlew.: fig. 6, inner band and summit of leaf-sheath, × 5, from Augusta, Illinois, *Mead;* fig. 7, inner face of perigynium, × 10, from central Arkansas, *F. L. Harvey*, no. 24; fig. 8, outer face of perigynium, × 10, from same collection.

Var. virginiana, n. var., all figs. from type-collection: fig. 1, panicle, × 1; fig. 2, summit of sheath, × 5; figs. 3 and 5, inner faces of perigynia, × 10; fig. 4, outer face of perigynium, × 10.

Plate 477. Juncus Longii, n. sp.: fig. 1, type-specimen, × ⅔, from Coddyshore, Sussex County, Virginia, *Fernald & Long*, no. 6144; fig. 2, tip of stolon, × 1, from the type; fig. 3, young fruits, × 8, from headwaters of Blackwater River, Virginia, *Fernald, Long & Smart*, no. 4711; fig. 4, seed, × 40, from the type.

J. marginatus Rostk.: fig. 5, base, showing stolons, × 1, from Courtland, Virginia, *Fernald & Long*, no. 6567; fig. 6, base of cespitose plant, × 1, from Orono, Maine, August 24, 1897, *Fernald;* fig. 7, fruits, × 8, from Williamsburg, Virginia, *Grimes*, no. 3704; fig. 8, seeds, × 40, from Shelburne, Nova Scotia, *Fernald & Long*, no. 23,640.

J. BIFLORUS Ell.: FIG. 9, rhizome, × 1, from Pembroke, Bryan County, Georgia, *Harper*, no. 1846; FIG. 10, fruits, × 8, from Homeville, Virginia, *Fernald & Long*, no. 6149; FIG. 11, seeds, × 40, from Brewster, Massachusetts, *Fernald*, no. 16,572.

PLATE 478. POLYGONELLA POLYGAMA (Vent.) Engelm. & Gray: FIG. 6, two plants, × ⅓, from Wilmington, North Carolina, *Biltmore Herb.*, no. 717[a]; FIG. 7, leaves, × 2, from south of Zuni, Virginia, *Fernald & Long*, no. 6809; FIG. 8, old rachis, showing the scarious ochreolae, × 10, from no. 6809.

P. POLYGAMA, var. CROOMII (Chapm.) Fernald: FIG. 9, leaves, × 2, from White Lake, Bladen County, North Carolina, *Oosting*, no. 33,648; FIG. 10, old rachis, showing the scarious ochreolae, × 10, from no. 33,648.

P. BRACHYSTACHYA Meisner: FIG. 4, leaves, × 2, from Myers, Florida, *Hitchcock*, no. 309; FIG. 5, old rachis, showing the firm ochreolae with coriaceous borders and exserted pedicels, × 10, from no. 309.

P. BRACHYSTACHYA, var. LAMINIGERA, n. var.: FIG. 1, two plants, × ⅓, from Indian River, Florida, *A. H. Curtiss*, no. 2433 (TYPE); FIG. 2, leaves, × 2, from TYPE; FIG. 3, old rachis, × 10, from TYPE.

PLATE 479. GEUM CANADENSE Jacq., var. BREVIPES, n. var.: FIG. 1, TYPE, × ⅔, from Nottoway River, southwest of Burt, Sussex County, Virginia, *Fernald & Long*, no. 6224; FIG. 2, portion of fruiting head, to show style-tips, × 10, from no. 6224; FIG. 3, mature achene, × 10, from type station, *Fernald & Long*, no. 6605.

Var. GRIMESII Fernald & Weatherby: FIG. 4, portion of summit of TYPE, × ⅔, from near Williamsburg, Virginia, *Grimes*, no. 3605.

PLATE 480. TYPE of CASSIA MARILANDICA L., in Linnean Herbarium (kindness of Mr. SPENCER SAVAGE).

PLATE 481. CASSIA HEBECARPA, n. sp.: FIG. 1, top of plant, × ⅔, from Newton, Massachusetts, *W. P. Rich* (TYPE); FIG. 2, base of petiole, showing gland and stipule, × 4, from TYPE; FIG. 3, ovary, after anthesis, × 2, from TYPE; FIG. 4, legumes, × 1, from Sheffield, Massachusetts, September 25, 1899, *Ralph Hoffmann.*

PLATE 482. LYSIMACHIA LANCEOLATA Walt.: FIG. 1, characteristic base, × 1, from Greensboro, North Carolina, *Wiegand & Manning*, no. 2484; FIG. 2, calyx, × 4, from Ewell, Virginia, *Grimes*, no. 4481; FIG. 3, bases of cauline leaves, × 4, from same plant as fig. 1; FIG. 4, rosette-leaf, × 4, from Allegheny County, Pennsylvania, *Shafer*, no. 1534.

L. HYBRIDA Michx.: FIG. 5, base, with autumnal rosette, × 1, from Saugus, Massachusetts, *Fernald & Svenson*, no. 1016; FIG. 6, bases of cauline leaves, × 4, from Bennett, New Jersey, *Gershoy*, no. 564; FIG. 7, calyx, × 4, from no. 564.

PLATE 483. GALIUM CIRCAEZANS Michx. and var. HYPOMALACUM, n. var. Explained on p. 450.

PLATE 484. EUPATORIUM ALBUM L., var. TYPICUM: FIG. 1, leaf, × 2, from Eastville, Virginia, *Fernald & Long*, no. 5492; FIG. 2, involucre, × 4, from Newfield, New Jersey, *Tidestrom*, no. 8066.

Var. GLANDULOSUM (Michx.) Fernald: FIG. 3, involucre, × 4, from Bluffton, South Carolina, September, 1879, *Mellichamp.*

Var. MONARDIFOLIUM, n. var.: FIG. 4, portion of TYPE, × ⅔, from near Chillum, Maryland, *Blake*, no. 9723; FIG. 5, leaf, × 2, from near Biltmore, North Carolina, *Biltmore Herb.*, no. 399[b]; FIG. 6, involucre, × 4, from the TYPE.

Var. SUBVENOSUM Gray: FIG. 7, leaf, × 2, from the TYPE, Middle Island, Long Island, New York, September 4, 1871, *E. S. Miller;* FIG. 8, involucre, × 4, from the TYPE.

PLATE 485. EUPATORIUM LEUCOLEPIS (DC.) Torr. & Gray: FIG. 1, characteristic foliage, × ⅔, from Hampton Furnace, New Jersey, September 10, 1914, *C. D. Fretz;* FIG. 2, stem and leaf-bases, × 4, from north of Swift Creek, Chesterfield County, Virginia, *Fernald & Long*, no. 6408.

Var. NOVAE-ANGLIAE, n. var.: FIG. 3, TYPE, × ⅔, from Loon Pond, Lakeville, Massachusetts, *Fernald & Long*, no. 10,492; FIG. 4, stem and base of

median leaf, × 4, from Smelt Pond, Kingston, Massachusetts, August 30, 1908, *Rich & Knowlton;* FIG. 5, stem and upper leaves, × 4, from TYPE.

PLATE 486, involucres × 8. CHRYSOPSIS MARIANA (L.) Nutt.: FIG. 1, from Atsion, New Jersey, *Gershoy*, no. 688; FIG. 2, from Savage Neck, Northampton County, Virginia, *Fernald & Long*, no. 5505.

Var. MACRADENIA, n. var.: FIG. 3, from the TYPE, southwest of Waverly, Virginia, *Fernald & Long*, no. 6885; FIG. 4, from northwest of Williamsburg, Virginia, *Grimes*, no. 3191.

PLATE 487. RUDBECKIA HIRTA L.: FIG. 4, lower surface of leaf, × 10, from Middletown, Rhode Island, July 3, 1909, *E. F. Williams*.

Var. SERICEA (T. V. Moore) Fernald: FIG. 3, lower surface of leaf, × 10, from Leeds, North Dakota, July 21, 1896, *Lunell*.

Var. CORYMBIFERA, n. var.: FIG. 1, TYPE, × ⅔; FIG. 2, lower surface of leaf, × 10, from TYPE.

EXTENSIONS OF RANGE AND A NEW SPECIES IN CAREX[1]

FREDERICK J. HERMANN

SEVERAL species of *Carex* collected by the writer in Utah and Colorado in 1933 which are apparently new to one or the other of those states may now be put on record as occurring there, and one new species calls for description. The species to be enumerated from Utah, all from the Uinta Mountains in the northeastern corner of the state, are not included in Tidestrom's "Flora of Utah and Nevada" (Contr. U. S. Nat. Herb. **25**. 1915) nor are they recorded for the state by Mackenzie in his recent monograph of the North American species of the genus (N. Am. Fl. **18**, parts 1–7. 1931–5) with the exception of *C. illota*, *C. atrata* and *C. physocarpa* which will be included here to establish definite locality records for these species. Neither of the two species from Colorado, which were collected on the White River Plateau, are ascribed to that state by Mackenzie.

The Utah reports represent range extensions principally from the north or east, the Colorado from the north and west.

Herbaria in which specimens supporting the records have been deposited are represented as follows: California Academy of Sciences (CA); Carnegie Museum (CM); Gray Herbarium (G); Herbarium of F. J. Hermann (H); University of Michigan (M); Missouri Botanical Garden (Mo); National Herbarium (N); New York Botanical Garden (NY); Philadelphia Academy of Natural Sciences (P); Rocky Mountain Herbarium (R); State College of Washington (W).

[1] Paper from the Department of Botany of the University of Michigan no. 623.

Utah

Carex vallicola Dewey. Daggett Co.: aspen grove, east slope of Eagle Creek Canyon, 2 miles west of Green Lakes, alt. 7200 ft., July 12, no. 4860 (H).

C. brunnescens (Pers.) Poir. Duchesne Co.: boggy north shore of Third Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 11,100 ft., July 21, no. 5183 (CA; CM; G; H; Mo); wet border of pond in spruce grove north of First Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 10,600 ft., July 23, no. 5224 (H; NY; R).

C. illota Bailey. Duchesne Co.: abundant on edge of streamlet in moist meadow just above timber line, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,300 ft., July 18, no. 4954 (CA; G; H; M; Mo; N; P; R; W); boggy north shore of Third Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 11,100 ft., July 21, no. 5180 (H; NY).

C. praticola Rydb. Duchesne Co.: crevices among boulders, rocky shore of Fourth Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 11,200 ft., July 20, no. 5096 (CA).

C. obtusata Liljebl. Daggett Co.: bank of stream tributary to Carter Creek in open aspen grove, alt. 8300 ft., July 11, no. 4788 (CA; G; H; Mo; R).

C. Drummondiana Dewey. Duchesne Co.: grassy, rock moraine bordering cold pond in tundra, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,340 ft., July 19, no. 4999 (H; Mo).

Reported by Mackenzie only from Alberta and Colorado.

C. misandra R. Br. Duchesne Co.: wet, grassy shore of small lake in tundra, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,350 ft., July 19, no. 5027 (CA; G; H; Mo; R).

A boreal species ranging from Greenland to Quebec and Alaska; farther south known previously only from central Colorado.

C. podocarpa R. Br. Duchesne Co.: grassy bank of cold pond in tundra, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,340 ft., July 19, no. 4988 (CA; H).

Wyoming is the southernmost state cited by Mackenzie for this species.

C. Nelsonii Mackenzie. Duchesne Co.: wet, grassy shore of small lake in tundra, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,300 ft., July 19, no. 5043 (H; Mo.). Summit Co.: tundra on N. W. ridge of Lamotte Peak, alt. 11,800 ft., August 18, no. 5992 (H).

A western extension; previously known only from Colorado and Wyoming.

C. **pelocarpa**, sp. nov. (§Atratae). Dense caespitosa e rhizomatibus crassis brevibus; culmi 2.6–4.1 dm. alti, laevigati, acute triangu-

lares, tenues, cernui, folia superantes; folia frondosa 3–6 plerumque basi aggregata, laminis crassis rigidulis, marginibus aliquantulum revolutis, ad apicem attenuatum minute serrulatis, vaginis albidis; spicae 2–5 ovoideae, 7–10 mm. longae, 5–7 mm. latae, sessiles in capitulum terminale confertae, spica terminalis gynaecandra laterales femineae bracteis brevibus una vel duabus; squamae oblongo-lanceolatae, acutae vel acuminatae, laeves, atro-purpureae perigyniis maxime angustiores; perigynia ovata, late ovata vel suborbiculata, 3.5–4.5 mm. longa, 2.5–3 mm. lata, valde complanata, membranacea, nitidissima laevesque, atro-purpurea, basi sessilia abrupte in rostrum bidentem 0.5–1 mm. longum contracta; achaenia triangularia ellipsoidali-ovoidea longe stipitata.

Densely cespitose from short, stout rootstocks; culms 2.6–4.1 dm. high, smooth, sharply triangular, slender and nodding, not at all stiff, two to three times the length of the leaves, more or less purplish-tinged and fibrillose at the base, the dried-up leaves of the previous year conspicuous; leaves with well-developed blades 3–6 to a fertile culm, mostly clustered at the base, the blades 5–24 cm. long, 1.5–4 mm. wide, thick and firm, light green, flat with somewhat revolute margins, channeled or slightly triangular toward the attenuate, strongly minutely serrulate apex, the midrib prominent, minutely serrulate ventrally toward the apex, the sheaths white-hyaline and very membranaceous ventrally, the ligule generally as wide as long but highly variable and often imperfect; spikes (2–5) generally 3, ovoid, 7–10 mm. long, 5–7 mm. wide, very closely-flowered, closely aggregated into a dense terminal head 14–19 mm. long, 13–17 mm. wide, the terminal gynaecandrous, the lateral pistillate; head subtended by an open bract averaging 5 mm. long, a second bract frequently present 10–20 mm. below the head, 25–30 mm. long, not exceeding the head, with short, colored, open sheath; scales oblong-lanceolate, acute to acuminate, the midrib more or less conspicuous, at least toward the tip, smooth, dark reddish-purple, not at all hyaline-margined or rarely slightly so toward the apex, the pistillate scales much narrower than the perigynia and generally shorter or equaling them but those toward the apex of the spike usually somewhat exceeding the perigynia; perigynia ovate to broadly ovate or suborbicular, 3.5–4.5 (averaging 4) mm. long, 2.5–3 (averaging 3) mm. wide, strongly flattened, appressed or ascending, 2-ribbed (the marginal), otherwise nerveless, membranaceous, smooth and not at all ciliate-scabrous, dark reddish-purple and very glossy, the margins sometimes straw-colored, rounded and sessile at the base, very abruptly short-beaked, the beak 0.5–1 mm. long, bidentate, dark purple to black; achenes triangular, elipsoid-ovoid, 1.5–1.75 mm. long, 0.8–0.9 mm. wide, long-stipitate, stramineous, finely granular, apiculate and jointed with the included style; stigmas 3, slender, white.—Duchesne Co.: dry, rocky shore of Fourth Chain Lake, Krebs Basin, S. E. slope of Mt. Emmons, alt. 11,200 ft., July 20, 1933, no. 5094 (CA; G; H); barren, rocky, S. E. slope of

Mt. Emmons, alt. 12,300 ft., July 20, 1933, no. 5143 (CA; H; P). Summit Co.: tundra on N. W. ridge of Lamotte Peak, alt. 11,800 ft., August 15, 1933, no. 5983 (CA; NY—Type).

C. pelocarpa is apparently endemic in the Uintas where it is locally frequent above timber line. Its large, dark and glistening heads nodding on slender flexuous culms are a striking characteristic in the field. In its smooth perigynia, stipitate achenes and clustered spikes it is related to *C. Helleri* Mackenzie of California and western Nevada. From that species it differs in its flexuous, entirely smooth culms, its shorter, broader and more closely congested heads, shorter spikes (7–10 mm. long, in *C. Helleri* 10–20 mm. long), shorter and broader scales (in *C. Helleri* even the lowermost scales conspicuously exceed the perigynia) which are less firm, not aristate, and with the less conspicuous midrib prominent only toward the tip, in its larger perigynia and in the markedly longer stipe of the achene. The short, aggregated spikes and generally broadly-ovate to suborbicular, strongly flattened perigynia simulate those of *C. nova* Bailey, a species of moister habitats in the Uintas, but from this it is readily set off by its long-stipitate achenes, its glossy, erect or ascending perigynia which are smooth-, not at all ciliate-scabrous-, margined, its much more deeply bidentate perigynium-beaks, its acuminate scales with more or less prominent midrib, its slender culms and nodding inflorescence, and its narrower, ovoid rather than suborbicular heads in which the individual spikes stand out conspicuously. In *C. nova* the sessile spikes are generally so closely congested into the stiffly erect head that the inflorescence superficially resembles a single spike, a semblance which is heightened at maturity by the widely spreading perigynia. *C. albo-nigra* Mackenzie and *C. Nelsonii* Mackenzie, the other sessile-spiked species of § *Atratae* found in the Uinta Mountains, differ from *C. pelocarpa*, among many other characters, in their erect heads and much larger and broader, blunt scales (often covering the perigynia in *C. albo-nigra* and conspicuously hyaline-margined), in their narrower, strongly granular-roughened perigynia and merely substipitate achenes; the former in its stiff, erect and relatively stout culms which are roughened above; the latter in its loosely cespitose habit and sub-inflated perigynia.

Associated plants were few in the arid, rocky habitat of *Carex pelocarpa* at its type station on Lamotte Peak. *Sieversia turbinata* (Rydb.) Greene was the dominant species here; *Gentiana Romanzovii*

Ledeb., *G. monantha* A. Nels., *Salix saximontana* Rydb., *Castilleja occidentalis* Torr., *Kobresia Bellardi* (All.) Degland and *Lychnis Kingii* S. Wats. were occasional in nearby crevices, but the only associates characterizing also the stations for the species on Mt. Emmons were *Senecio Fremontii* T. & G., *Mertensia Bakeri* Greene and *Cystopteris fragilis* (L.) Bernh. On the steep, rocky shore of Fourth Chain Lake *Castilleja rhexifolia* Rydb., *Erigeron acris* L., var. *debilis* Gray, *Cryptogramma acrostichoides* R. Br., and *Carex praticola* Rydb. shared its habitat, while on the higher barren slopes of Mt. Emmons these gave place to *Festuca ovina* L., var. *brachyphylla* (Schult.) Piper, *Erigeron compositus* Pursh and its variety *incertus* A. Nels., *Castilleja viscida* Rydb., *Polemonium viscosum* Nutt., *Chaenactis Douglasii* H. & A., var. *alpina* Gray, *Smelowskia calycina* (Stephan.) C. A. Meyer, *Artemisia Michauxiana* Bess. and *Penstemon uintahensis* Pennell.

C. ATRATA L. DUCHESNE CO.: rocky, alpine meadow at timber line, S. E. slope of Mt. Emmons above Chain Lakes, alt. 11,300 ft., July 18, nos. 4965 (CA; H) and 4965½ (G; H; Mo; R).

C. PHYSOCARPA Presl. DUCHESNE CO.: grassy bank of cold pond in tundra above Chain Lakes, S. E. slope of Mt. Emmons, alt. 11,340 ft., July 19, nos. 5013 (H), 5018 (H; Mo), 5029 (G), 5031 (R), and 5039 (CA; H). SUMMIT CO.: wet, grassy shore of Duck Lake, N. W. slope of Lamotte Peak, alt. 10,200 ft., August 15, no. 5937 (H).

COLORADO

C. JONESII Bailey. GARFIELD CO.: edge of spruce woods in low, moist meadow along trail to "Flat Top" above Trappers' Lake, alt. 10,500 ft., August 2, no. 5589 (CA; H).

Recorded by Mackenzie from Washington, Oregon, California and Wyoming.

C. NEUROPHORA Mackenzie. GARFIELD CO.: wet, open bank of White River ¼ mile north of Trappers' Lake, alt. 9450 ft., July 29, no. 5444 (G; H; Mo).

A northwestern species known to Mackenzie from Washington, Oregon, Idaho, Montana and Wyoming.

UNIVERSITY OF MICHIGAN.

NOTES ON EUPHORBIA

Louis C. Wheeler

Euphorbia glyptosperma Engelm., Bot. Mex. Bound Survey **2**: 187. 1869.

The only hint Engelmann gave as to the basis of this species was: "E. polygonifolia, *Hook. Fl. Bor. Am.* fide spec. auctoris *non Linn.*" In Engelmann's herbarium, now at Missouri Botanic Garden, are two specimens from Hooker's herbarium. They are E. glyptosperma. Both specimens are rather fragmentary to be used as types even though they do show beyond question that *E. polygonifolia, sensu* Hooker, is *E. glyptosperma*. There is another specimen in the Engelmann herbarium labeled as this species in what I take to be Engelmann's hand. It was collected at Fort Kearney on the Platte, July, 1856, *Henry Engelmann*. I choose this specimen as the type since it was probably in Geo. Engelmann's hands when he described the species and it is a good specimen. Fort Kearney is not on modern maps but it is shown on the map of the Territory of the United States from the Mississippi River to the Pacific Ocean in the Pacific Railroad Reports vol. 11, as being very close to the present town of Newark, Kearney Co. Nebraska. It is diagonally across the Platte River from the present town of Kearney.

Euphorbia manca A. Nelson, Bot. Gaz. **47**: 437. 1909. *Tithymalus mancus* (A. Nelson) Heller, Muhl. **9**: 67. 1913. The type: Mancos, Colorado, *C. F. Baker, F. S. Earle, & S. M. Tracy, No. 23*, June 23, 1898 (Herb. Univ. of Wyoming), differs in no respect from many California specimens of *Euphorbia crenulata*. There is one point in the description by which it appears to differ: "inflorescence once or twice trichotomous:". The terms of the description are based partly on mistaken observation and partly on use of terminology which may be confusing. "Once trichotomous" refers to the three-rayed inflorescence as I choose to describe it. "Twice trichotomous" must have been based on the assumption that if the first branching of the inflorescence were trichotomous the succeeding branchings would also be. Unfortunately the rays of the inflorescence in section *Tithymalus* are almost invariably dichotomous as they are in this case. The characters used in the key to separate *E. crenulata* and *E. manca* simply do not hold.

Gray Herbarium

The Identity of Lobelia glandulosa Walt.—It has not been generally recognized that much of the description of *Lobelia glandulosa* Walt. Fl. Carol. 218 (1788) can apply only to *L. puberula* Michx. Fl. Bor.-Am. ii. 152 (1803). Walter's diagnosis was as follows:

> *glandulosa* 5. caule erecto subpiloso, foliis oblongis obtuse sublanceolatis subdentatis longitudine florum, flor. axillaribus solitariis purpureis pedunculis brevibus, bracteis 2 glandula terminatis, capsulis villosi, *calycis laciniis dentatis* longis suberectis.

The subpilose stem and the oblong, obtuse leaves apply only to *L. puberula*, but the dentate calyx-lobes belong only to *L. glandulosa* as currently understood. The balance of the description might apply to either species. Accordingly we asked Mr. C. A. Weatherby, on his visit to London in 1935, to examine Walter's specimens. He reported that there are three pieces on the sheet: one clearly *L. puberula* Michx., another (described by Walter as *L. siphilitica?*) which is the broad-leaved extreme of *L. elongata* Small, and a third, which is the narrow-leaved extreme of *L. elongata*. Mr. Weatherby could find nothing agreeing with Walter's "*calycis laciniis dentatis*," i. e. the plant which, since Elliott, has regularly passed as *L. glandulosa*. However, in the Gray Herbarium there is a full raceme of such a plant, with definitely dentate calyx-lobes, which was labeled by Asa Gray as follows; "*Lobelia* Walt. *L. glandulosa* fl.! Cf. no. 2 in notes." This specimen is in a pocket labeled in Gray's hand: "Herb. Walter! See notes."

The pertinent facts are as follows. Asa Gray examined the Walter Herbarium in February, 1839, and left a small book of notes upon it. Under *Lobelia glandulosa* there is the following comment: "I take fl. fr. specimen verum, but the cal. segments are entire. A loose spec. without specific name—a smooth plant—agrees better with descr [iption] as to calyx (no. 2)." It becomes apparent, therefore, that the only element which Walter had with "*calycis laciniis dentatis*" was given to Asa Gray. In view of the fact that this is the only extant type of the Walter plant with dentate calyx-lobes, the plant definitely accepted by Elliott, Gray and McVaugh as *L. glandulosa*, the name should stand for this element. A portion of the inflorescence has been returned to the British Museum.—M. L. Fernald and Ludlow Griscom.

Volume 39, no. 467, including pages 425–464 and plates 482–487, was issued 5 November, 1937.

ERRATA

Page 22, line 37; for *sempervirens* read *sempervirens*.
Page 62, line 19; *for* ♂ *read* ♀; *for* ○ *read* ♀.
Page 62, line 20; *for* ○ after all three names *read* ♀.
Page 62, line 21; *for* ○ *read* ♀.
Page 195, line 6; *for* (2) *read* (3).
Page 195, line 7; *for* (3) *read* (2).
Page 233, line 5; for "ALFILERIA (FILAREE) SEED" *read* ALFILERIA (FILAREE) "SEED."
Page 264, line 22; *for* Acinda *read* Alcinda.
Page 264, line 28; *for* Fermont *read* Fremont *and for* ; near *read* . MICHIGAN: near.
Plates 463, 464 and 465; in caption *omit* SERIES TENUISSIMAE.
Page 309, line 4; *for* 472 *read* 473.
Page 311, line 13; *for* as long to *read* as long as to.
Page 312, line 9: for Petrak read *Petrak*.
Page 321, line 21; *for* KATHERINE *read* KATHARINE.
Page 337, line 31; *for* Isle Wight *read* Isle of Wight.
Page 341, line 27; *for* or *read* of.
Page 399, line 22; *for* LASIONEURA *read* LASIONEURON.
Page 437, line 26; *for* **carolina** read **caroliniana** and for *carolina* read *caroliniana*.

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